

Claims

What is claimed is:

1. An makeup/breakout system for use with a horizontal boring machine having a drive system, a drill string comprised of pipe sections connectable at threaded pipe joints, and a spindle for connecting the drill string to the drive system, the drive system being comprised of a drive frame, a rotation drive mounted to the drive frame, and a rotation shaft
5 driven by the rotation drive and characterized by an amount of axial float, the makeup/breakout system comprising:

a biasing member positioned to urge the rotation shaft to a center float position;
a float sensor adapted to determine the amount of float in the rotation shaft and to
transmit a float signal; and
10 a connection controller adapted to receive the float signal and to coordinate thrust
and rotation in response to the float signal.

2. The system of claim 1 wherein the float sensor comprises:

a sensor rod attached to the drive frame; and
a magnet coupled to the rotation shaft and adapted to move along the sensor rod;
wherein the float signal is representative of a position of the magnet on the
5 sensing rod.

3. The system of claim 1 wherein the float sensor comprises:

a sensor rod attached to the rotation shaft; and
a magnet coupled to the drive frame and adapted to move along the sensor rod;
wherein the float signal is representative of a position of the magnet on the
5 sensing rod.

4. The system of claim 1 wherein the biasing member comprises a first

spring positioned proximate an aft end of the rotation drive and a second spring positioned proximate a fore end of the rotation drive.

5. The system of claim 1 wherein the connection controller is further adapted to send a signal to the drive system to limit thrust to a predetermined amount when the spindle is not rotating and is being moved toward or from the drill string.

6. The system of claim 5 wherein the thrust is limited to 60% of a maximum output.

7. The system of claim 1 wherein the connection controller is further adapted to calculate a thrust output based on a rotation output.

8. The system of claim 1 wherein the connection controller is further adapted to send a signal to the drive system to adjust thrust to an amount calculated based upon the float signal indicative of the amount of float.

9. The system of claim 2 wherein the connection controller is further adapted to send a signal to the drive system to stop thrust if the float signal indicates the float has reached a front limit and the drive system is pulling back or if the float signal indicates the float has reached a rear limit and the drive system is pushing forward.

10. The system of claim 2 wherein the connection controller is further adapted to send a signal to the drive system to stop rotation if the float signal indicates the float has reached a front limit and the spindle is rotating clockwise or if the float signal indicates the float has reached a rear limit and the spindle is rotating counterclockwise.